which shall be full compensation for all materials including anchorage system, protective coating, equipment, labor and incidentals necessary for furnishing and installing the expansion devices and, if required, curb and sidewalk expansion dams and barrier sliding plates.

Payment will be made under:

Pay Item		Pay Unit
520.21	Expansion Device - Gland Seal	Each
520.22	Expansion Device - Compression Seal	Each

SECTION 521 - FINGER JOINT AND FABRIC TROUGH/FABRIC CURTAIN

521.01 Description This work shall consist of fabricating and installing finger joint expansion devices and fabric troughs or fabric curtains when required, including the anchorage system, curb and sidewalk expansion dams, barrier sliding plates as required, support components for fabric troughs or curtains when required, and any metal downspout(s) and/or chute(s) used to guide the discharge from the trough(s) when required, and all necessary materials and equipment required to complete the work as shown on the plans and in accordance with these specifications.

521.02 Materials - Finger Joints Plates requiring a non-skid surface shall conform to the requirements of ASTM A786/A786M, ASTM A36/A36M. Other plates shall conform to the requirements of ASTM A36/A36M or ASTM A572/A572M. Shapes shall conform to the requirements of ASTM A500, Grades A and B, or ASTM A992/A992M. Other weldable steels may be used with approval of the Fabrication Engineer. Anchor studs shall conform to the requirements of Section 711.06 - Stud Shear Connectors, Anchor and Fasteners. Bolts shall conform to the requirements of AASHTO M169/M169M (ASTM A325/A325M).

521.03 General All work shall conform to the applicable provisions of Section 504 - Structural Steel. Completed expansion devices and any required support components for troughs or curtains, expansion dams, barrier sliding plates, downspouts and chutes shall be hot dipped galvanized to the requirements of AASHTO M111 (ASTM A123). Anchorage parts encased in concrete may be supplied in the ungalvanized condition.

Each expansion device shall be shipped fully assembled, shall be installed as a unit, and shall be equipped with shipping and temperature adjustment devices approved by the Resident. When a project is built in stages, and if desired by the Contractor, the expansion device may be shipped in two or more sections, as approved by the Fabrication Engineer, with appropriate provisions for field splicing.

521.04 Materials Fabric Trough or Curtain The fabric for the trough or curtain shall be 3 mm to 5 mm [• in to $^{3}/_{16}$ in] in thickness and shall consist of a single layer of 415 g [14.6 oz] woven nylon fabric, or the equivalent in multiple layers of woven nylon fabric, laminated between two or more layers of neoprene rubber. The neoprene shall conform to the following requirements:

Physical Properties:

Grade (Duro)	60
Original Physical Properties	60 +/- 5
Hardness ASTM D2240	
Tensile Strength, Minimum	13.8 MPa [2,000 psi]
ASTM D412	
Elongation at Break, Minimum Accelerated	300%
Test to Determine Long Term Aging Characteristics	
Oven Aged - 70 Hours/100ºC [70 Hours/212ºF]	
ASTM D573	
Hardness, Points Change, Maximum	+15
Tensile Strength, Change, Maximum	-15%
Elongation at Break, Change, Maximum	-40%
Ozone - 1 PPM in Air by Volume 20% Strain	No cracks
38 +/- 1ºC [100 +/- 2ºF] - ASTM D1149*	100 hours
(*Samples shall be solvent wiped before test to remove any traces of surface impurities.)	
Compression Set - 22 Hours/100ºC [22 Hours/212ºF]	
ASTM D395 - Method B, 0/0 Maximum	35%
ASTM D746 - Procedure B	-40ºC [-40ºF]

Brittleness at No Failure	
Fluid Resistance - ASTM D471	
70 Hours/100ºC [70 Hours/212ºF] in ASTM Oil No. 3	
Change in volume, Maximum	+120%
Change in tensile strength, Maximum	-70%
Change in ultimate elongation, Maximum	-55%

The finished fabric shall have a minimum breaking strength of 120 N/mm [700 lb/in] when tested by ASTM Test Method D5034. The minimum breaking strength shall be determined on a sample taken transverse to the centerline of the trough, or a random sample taken from the curtain.

When delivered to the job site, each separate length, roll or container shall be clearly tagged or marked with the manufacturer's name, trade mark and lot number. A lot is defined as that amount of fabric manufactured at one time from one batch of elastomer. A batch is defined as that amount of elastomer prepared and compounded at one time. The Contractor shall furnish a Materials Certification Letter for each lot in accordance with Division 700 - Materials.

Not less than thirty days prior to the installation of the trough, a sample length of each lot of fabric, not less than 1 m [3 ft] long, shall be submitted to the Resident for testing. All samples shall be taken from the lot(s) to be furnished, shall be tagged for identification purposes and shall be furnished to the Resident free of cost. Approval of the material must be obtained before the material is incorporated in the work.

521.05 Fabrication The Contractor shall submit working drawings to the Fabrication Engineer for approval in accordance with Section 105.7 - Working Drawings. These drawings shall include, but not be limited to, the following information: The complete details of the method, materials and equipment proposed to be used in the installation operation. Such details shall give complete specifications and details of the elastomeric trough or curtain, and other data pertaining to the installation operation.

Installation holes shall be cut round and cleanly with a sharp tool. Holes having jagged or roughly cut edges will be cause for rejection of the trough or curtain unit.

521.06 Construction of Fabric Trough Where a splice is required for stage construction, the upper section of the trough shall be fitted inside the lower section of the trough in such a manner that any water spillage through the splice shall be

eliminated.

521.07 Method of Measurement Expansion Device - Finger Joint will be measured by each unit, complete in place and accepted. Each unit shall consist of one pair of matching devices including anchorage system, curb and sidewalk expansion dams, barrier sliding plates as required, and if shown on the plans, trough or curtain components, downspouts and chutes.

Fabric trough or curtain for finger joint will be measured for payment by each unit complete in place and accepted.

521.08 Basis of Payment The accepted quantity of Expansion Device - Finger Joint will be paid for at the contract unit price each, which payment shall be full compensation for all materials including anchorage system, curb and sidewalk expansion dams, barrier sliding plates, trough or curtain support systems, downspouts and chutes, galvanizing, equipment, labor and incidentals necessary for furnishing and installing the expansion devices and expansion dams. The accepted quantity of fabric trough or curtain for finger joint will be paid for at the contract price each, complete in place and accepted, which price shall include all materials, equipment, tools and labor incidentals thereto.

Payment will be made under:

Pay Item		Pay Unit
521.23	Expansion Device - Finger Joint	Each
521.32	Fabric Trough for Finger Joint	Each
521.33	Fabric Curtain for Finger Joint	Each

SECTION 522 - EXPANSION DEVICES - MODULAR

522.011 Description This work shall consist of furnishing and installing shop fabricated modular expansion devices. This shall include, but not be limited to, neoprene seal elements, steel transverse dividers and end channels, support bars and bearings, anchorages, sidewalk, median and curb expansion dams and barrier slide plates, all as specified herein or specified in the Contract documents.

522.012 Materials Materials shall meet the requirements specified in the following Sections of Division 700 -